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L48

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<u>L48</u>	restore near adjacencies	0	<u>L48</u>
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<u>L46</u>	restore near adjacencies near OSPF	0	<u>L46</u>
<u>L45</u>	L44 and adjacency	4	<u>L45</u>
<u>L44</u>	L43 and neighbor	5	<u>L44</u>
<u>L43</u>	L42 and state	7	<u>L43</u>
<u>L42</u>	L41 and interface	7	<u>L42</u>

<u>L41</u>	L40 and router	8	<u>L41</u>
<u>L40</u>	L38 and hello	12	<u>L40</u>
<u>L39</u>	L38 and incoming near hello	0	<u>L39</u>
<u>L38</u>	370/218.ccls.	246	<u>L38</u>
<u>L37</u>	l29 and incoming near hello	0	<u>L37</u>
<u>L36</u>	incoming near hello and router near interface	1	<u>L36</u>
<u>L35</u>	L33 and incoming	5	<u>L35</u>
<u>L34</u>	L33 and incoming near hello	0	<u>L34</u>
<u>L33</u>	L32 and adjacency	13	<u>L33</u>
<u>L32</u>	L31 and neighbor	34	<u>L32</u>
<u>L31</u>	L30 and state	60	<u>L31</u>
<u>L30</u>	L29 and hello	64	<u>L30</u>
<u>L29</u>	router adj interface	1009	<u>L29</u>
<u>L28</u>	L26 and point-to-point	6	<u>L28</u>
<u>L27</u>	L26 and unicast	2	<u>L27</u>
<u>L26</u>	L23 and neighbor	12	<u>L26</u>
<u>L25</u>	L23 and interface near predefined	0	<u>L25</u>
<u>L24</u>	L23 and interface near predetermined	0	<u>L24</u>
<u>L23</u>	L22 and interface	16	<u>L23</u>
<u>L22</u>	adjacency near router and hello	17	<u>L22</u>
<u>L21</u>	L19 and drop near adjacency	0	<u>L21</u>
<u>L20</u>	L19 and dropping near adjacency	0	<u>L20</u>
<u>L19</u>	L18 and neighbor	30	<u>L19</u>
<u>L18</u>	L16 and state	43	<u>L18</u>
<u>L17</u>	L16 and interface near predetermined	0	<u>L17</u>
<u>L16</u>	L15 and interface near router	46	<u>L16</u>
<u>L15</u>	hello and point-to-point	406	<u>L15</u>
<u>L14</u>	L13 and adjacency	1	<u>L14</u>
<u>L13</u>	L12 and neighbor	2	<u>L13</u>
<u>L12</u>	l5 and router	4	<u>L12</u>
<u>L11</u>	router near predetermined near state	0	<u>L11</u>
<u>L10</u>	l5 and predetermined near state	0	<u>L10</u>
<u>L9</u>	L6 and predefined near state	0	<u>L9</u>
<u>L8</u>	L6 and predetermined near state	0	<u>L8</u>
<u>L7</u>	L6 and predetermined adj state	0	<u>L7</u>
<u>L6</u>	L5 and router	4	<u>L6</u>
<u>L5</u>	unicast near hello	4	<u>L5</u>
<u>L4</u>	create near unicast near hello	0	<u>L4</u>
<u>L3</u>	L1 and hello	1	<u>L3</u>
<u>L2</u>	L1 and unicast near hello	0	<u>L2</u>
<u>L1</u>	interface near router and predetermined near state	34	<u>L1</u>



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### 1 [Active measurements: Experience in black-box OSPF measurement](#)

Aman Shaikh, Albert Greenberg

 November 2001 **Proceedings of the 1st ACM SIGCOMM Workshop on Internet Measurement**

Full text available: pdf(1.98 MB)

 Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

OSPF (Open Shortest Path First) is a widely used intra-domain routing protocol in IP networks. Internal processing delays in OSPF implementations impact the speed at which updates propagate in the network, the load on individual routers, and the time needed for both intra-domain and inter-domain routing to reconverge following an internal topology or a configuration change. An OSPF user, such as an Internet Service Provider, typically has no access to the software implementation, and no way to e ...

**Keywords:** OSPF, SPF calculation, black-box measurements, routing

### 2 [Routing stability in congested networks: experimentation and analysis](#)

Aman Shaikh, Anujan Varma, Lampros Kalampoukas, Rohit Dube

 August 2000 **ACM SIGCOMM Computer Communication Review , Proceedings of the conference on Applications, Technologies, Architectures, and Protocols for Computer Communication**, Volume 30 Issue 4

Full text available: pdf(329.90 KB)

 Additional Information: [full citation](#), [abstract](#), [citations](#), [index terms](#)

Loss of the routing protocol messages due to network congestion can cause peering session failures in routers, leading to route flaps and routing instabilities. We study the effects of traffic overload on routing protocols by quantifying the stability and robustness properties of two common Internet routing protocols, OSPF and BGP, when the routing control traffic is not isolated from data traffic. We develop analytical models to quantify the effect of congestion on the robustness of OSPF a ...

### 3 [IP next generation overview](#)

Robert M. Hinden

 June 1996 **Communications of the ACM**, Volume 39 Issue 6

Full text available: pdf(610.92 KB)

 Additional Information: [full citation](#), [references](#), [index terms](#), [review](#)

#### 4 Session 8: IGP and topology: Analysis of link failures in an IP backbone

Gianluca Iannaccone, Chen-nee Chuah, Richard Mortier, Supratik Bhattacharyya, Christophe Diot

November 2002 **Proceedings of the 2nd ACM SIGCOMM Workshop on Internet measurement**

Full text available:  [pdf\(634.76 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Today's IP backbones are provisioned to provide excellent performance in terms of loss, delay and availability. However, performance degradation and service disruption are likely in the case of failure, such as fiber cuts, router crashes, etc. In this paper, we investigate the occurrence of failures in Sprint's IP backbone and their potential impact on emerging services such as Voice-over-IP (VoIP). We first examine the frequency and duration of failure events derived from IS-IS routing updates c ...

#### 5 Full papers: Tree bitmap: hardware/software IP lookups with incremental updates

Will Eatherton, George Varghese, Zubin Dittia

April 2004 **ACM SIGCOMM Computer Communication Review**, Volume 34 Issue 2

Full text available:  [pdf\(189.39 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#)

Even with the significant focus on IP address lookup in the published literature as well as focus on this market by commercial semiconductor vendors, there is still a challenge for router architects to find solutions that simultaneously meet 3 criteria: scaling in terms of lookup speeds as well as table sizes, the ability to perform high speed updates, and the ability to fit into the overall memory architecture of an Level 3 forwarding engine or packet processor with low systems cost overhead. I ...

#### 6 Routing design in operational networks: a look from the inside

Geoffrey Xie, Jibin Zhan, David A. Maltz, Hui Zhang, Albert Greenberg, Gísli Hjálmtýsson

August 2004 **ACM SIGCOMM Computer Communication Review , Proceedings of the 2004 conference on Applications, technologies, architectures, and protocols for computer communications**, Volume 34 Issue 4

Full text available:  [pdf\(372.95 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

In any IP network, routing protocols provide the intelligence that takes a collection of physical links and transforms them into a network that enables packets to travel from one host to another. Though routing design is arguably the single most important design task for large IP networks, there has been very little systematic investigation into how routing protocols are actually used in production networks to implement the goals of network architects. We have developed a methodology for reverse ...

**Keywords:** network modeling, reverse engineering, routing design, static configuration analysis

#### 7 Does AS size determine degree in as topology?

Hongsuda Tangmunarunkit, John Doyle, Ramesh Govindan, Walter Willinger, Sugih Jamin, Scott Shenker

October 2001 **ACM SIGCOMM Computer Communication Review**, Volume 31 Issue 5

Full text available:  [pdf\(298.25 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#)

In a recent and much celebrated paper, Faloutsos *et al.* [6] found that the inter Autonomous System (AS) topology exhibits a power-law degree distribution. This result was quite unexpected in the networking community, and stirred significant interest in exploring the possible causes of this phenomenon. The work of Barabasi *et al.* [2], and its application to network topology generation in the work of Medina *et al.* [9], have

explored a promising class ...

8 Measuring ISP topologies with rocketfuel

Neil Spring, Ratul Mahajan, David Wetherall, Thomas Anderson

February 2004 **IEEE/ACM Transactions on Networking (TON)**, Volume 12 Issue 1

Full text available:  [pdf\(732.86 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#), [review](#)

To date, realistic ISP topologies have not been accessible to the research community, leaving work that depends on topology on an uncertain footing. In this paper, we present new Internet mapping techniques that have enabled us to measure router-level ISP topologies. Our techniques reduce the number of required traces compared to a brute-force, all-to-all approach by three orders of magnitude without a significant loss in accuracy. They include the use of BGP routing tables to focus the measurem ...

**Keywords:** communication system operations and management, internet, measurement, network reliability

9 The use of connectionless network layer protocols over FDDI networks

Dave Katz

July 1990 **ACM SIGCOMM Computer Communication Review**, Volume 20 Issue 3

Full text available:  [pdf\(1.15 MB\)](#) Additional Information: [full citation](#), [abstract](#), [index terms](#)

Methods for running the DoD IP and OSI connectionless network layer protocols over the FDDI medium are presented. Issues specific to the interaction between network layer protocols and FDDI are discussed, and some possible approaches to problems encountered are evaluated. The OSI protocol suite is examined in particular detail. This work was supported in part by National Science Foundation agreement no. NCR 8720904.

10 Topological routing in SURF: Generating a rubber-band sketch

Wayne Wei-Ming Dai, Tal Dayan, David Staepelaere

June 1991 **Proceedings of the 28th conference on ACM/IEEE design automation**

Full text available:  [pdf\(623.33 KB\)](#) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

11 Reviewed articles: Achieving sub-second IGP convergence in large IP networks

Pierre Francois, Clarence Filsfils, John Evans, Olivier Bonaventure

July 2005 **ACM SIGCOMM Computer Communication Review**, Volume 35 Issue 3

Full text available:  [pdf\(163.62 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

We describe and analyse in details the various factors that influence the convergence time of intradomain link state routing protocols. This convergence time reflects the time required by a network to react to the failure of a link or a router. To characterise the convergence process, we first use detailed measurements to determine the time required to perform the various operations of a link state protocol on currently deployed routers. We then build a simulation model based on those measuremen ...

**Keywords:** IS-IS, OSPF, convergence time, intradomain routing

12 Performance and scalability of mobile wireless base-station-oriented networks

Stuart D. Milner, Sohil Thakkar, Karthikeyan Chandrashekar, Wei-Lun Chen

April 2003 **ACM SIGMOBILE Mobile Computing and Communications Review**, Volume 7 Issue 2

Full text available:  [pdf\(1.10 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#)

This paper focuses on the performance and scalability of mobile, base-station-oriented wireless networks, which have been the subject of research and development projects sponsored by the Defense Advanced Research Projects Agency. The background and rationale for such networks is presented as well as performance and scalability analyses of their routing, mobility, and quality of service models. Using systems-oriented, large-scale discrete event simulation, both performance scalability and comple ...

13 Features: Lack of priority queuing considered harmful

Vijay Gill


November 2004 **Queue**, Volume 2 Issue 8

Full text available:  [pdf\(914.98 KB\)](#) Additional Information: [full citation](#), [index terms](#)  
 [html\(18.10 KB\)](#)

14 FIRE: flexible Intra-AS routing environment

Craig Partridge, Alex C. Snoeren, W. Timothy Strayer, Beverly Schwartz, Matthew Condell, Isidro Castiñeyra

August 2000 **ACM SIGCOMM Computer Communication Review , Proceedings of the conference on Applications, Technologies, Architectures, and Protocols for Computer Communication**, Volume 30 Issue 4

Full text available:  [pdf\(107.75 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Current routing protocols are monolithic, specifying the algorithm used to construct forwarding tables, the metric used by the algorithm (generally some form of hop-count), and the protocol used to distribute these metrics as an integrated package. The Flexible Intra-AS Routing Environment (FIRE) is a link-state, intra-domain routing protocol that decouples these components. FIRE supports run-time-programmable algorithms and metrics over a secure link-state distribution protocol. By allow ...

15 Measurement tools: Structure preserving anonymization of router configuration data

David A. Maltz, Jibin Zhan, Geoffrey Xie, Hui Zhang, Gísli Hjálmtýsson, Albert Greenberg, Jennifer Rexford

October 2004 **Proceedings of the 4th ACM SIGCOMM conference on Internet measurement**

Full text available:  [pdf\(128.06 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

A repository of router configuration files from production networks would provide the research community with a treasure trove of data about network topologies, routing designs, and security policies. However, configuration files have been largely unobtainable precisely because they provide detailed information that could be exploited by competitors and attackers. This paper describes a method for anonymizing router configuration files by removing all information that connects the data to the ...

**Keywords:** data anonymization, router configuration, security

16 Measuring ISP topologies with rocketfuel

Neil Spring, Ratul Mahajan, David Wetherall

August 2002 **ACM SIGCOMM Computer Communication Review , Proceedings of the 2002 conference on Applications, technologies, architectures, and protocols for computer communications**, Volume 32 Issue 4

Full text available:  [pdf\(1.21 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

To date, realistic ISP topologies have not been accessible to the research community, leaving work that depends on topology on an uncertain footing. In this paper, we present new Internet mapping techniques that have enabled us to directly measure router-level ISP topologies. Our techniques reduce the number of required traces compared to a brute-force, all-to-all approach by three orders of magnitude without a significant loss in accuracy. They include the use of BGP routing tables to focus the ...

### 17 DECnet Network Protocol

April 1999 **Linux Journal**

Full text available:  [html\(28.49 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This article contains information on how to use and configure available DECnet software as well as information on how the kernel code works.

### 18 Topology discovery in heterogeneous IP networks: the *NetInventory* system

Yuri Breitbart, Minos Garofalakis, Ben Jai, Cliff Martin, Rajeev Rastogi, Avi Silberschatz

June 2004 **IEEE/ACM Transactions on Networking (TON)**, Volume 12 Issue 3

Full text available:  [pdf\(435.97 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Knowledge of the up-to-date physical topology of an IP network is crucial to a number of critical network management tasks, including reactive and proactive resource management, event correlation, and root-cause analysis. Given the dynamic nature of today's IP networks, keeping track of topology information manually is a daunting (if not impossible) task. Thus, effective algorithms for automatically discovering physical network topology are necessary. Earlier work has typically concentrated on e ...

**Keywords:** IP network management, SNMP MIBs, physical network topology, switched Ethernet

### 19 Special issue: AI in engineering

D. Sriram, R. Joobhani

January 1985 **ACM SIGART Bulletin**, Issue 91

Full text available:  [pdf\(8.79 MB\)](#) Additional Information: [full citation](#), [abstract](#)

The papers in this special issue were compiled from responses to the announcement in the July 1984 issue of the SIGART newsletter and notices posted over the ARPAnet. The interest being shown in this area is reflected in the sixty papers received from over six countries. About half the papers were received over the computer network.

### 20 Plutarch: an argument for network pluralism

Jon Crowcroft, Steven Hand, Richard Mortier, Timothy Roscoe, Andrew Warfield

August 2003 **ACM SIGCOMM Computer Communication Review , Proceedings of the ACM SIGCOMM workshop on Future directions in network architecture**, Volume 33 Issue 4

Full text available:  [pdf\(209.51 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

It is widely accepted that the current Internet architecture is insufficient for the future: problems such as address space scarcity, mobility and non-universal connectivity are already with us, and stand to be exacerbated by the explosion of wireless, ad-hoc and sensor networks. Furthermore, it is far from clear that the ubiquitous use of standard transport and name resolution protocols will remain practicable or even desirable. In this paper we propose *Plutarch*, a new inter-networking ar ...

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